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AUTHOR Craven, Rhonda G.; McInerney, Valentina; Marsh, Herbert W.
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ABSTRACT

This study employed a multi-cohort multi-occasion (MCMO) design to measure self-concept and academic achievement among 5- and 6-year-olds. Preliminary findings from the first two waves of data were used to examine: (1) the structure and development of a multidimensional self-concept; (2) the stability of self-concept responses over time; (3) the relationship between prior academic self-concept and subsequent growth in academic achievement; and (4) theoretical predictions about the development of self-concept that heretofore have been based primarily on research with older children. Preliminary results provided support for the construct validity of self-concept responses based on the Self Description Questionnaire--Infants (SDQ-I). Findings from this study's use of a 64-item questionnaire indicated that the use of short instruments may be counter-productive and may account for some of the difficulties researchers have in obtaining responses with good psychometric properties from very young children. The separation of competency and affective components of self-concept was supported for young children. In addition, it was demonstrated that achievement was more strongly correlated with cognitive components of self-concept than affective components. Over a period of 6 months, the structure of young children's self-concepts and the relationship of self-concept to academic achievement were demonstrated to be relatively stable over time and over the two age cohorts considered. (Contains 36 references.) (EV)

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The Structure and Development of Young Children's Self-Concepts and Relation to Academic Achievement

Rhonda G. Craven, Valentina McInerney and Herbert W. Marsh
University of Western Sydney

Correspondence concerning this article should be addressed to Associate-Professor Rhonda G. Craven, Faculty of Education and Languages, University of Western Sydney, Macarthur, PO Box 555, Campbelltown, NSW 2560 Australia. *We would like to gratefully acknowledge the financial support provided by a grant from the Australian Research Council and the Self-concept Enhancement & Learning Facilitation (SELF) Research Centre, see the SELF Research Centre website for further information on self-concept research and the forthcoming self-concept research international conference - http://edweb.macarthur.uws.edu.au/self/. Paper presented at the conference of the American Education Research Association, 24 April - 28 April, 2000.*

Developing children's self-concepts is a critical educational goal in Australia and throughout the world. Despite considerable advances in self-concept theory, measurement, research, and practice with older students, there has been only limited progress with very young children 5-8 years of age. This is unfortunate as this developmental period may be crucial in the formation of a positive self-concept that is related to the attainment of many academic, social, physical, emotional, and developmental outcomes. This failure to pursue research with this very young age group is due, in large part, to problems associated with measuring self-concepts of very young children. In pursuing this issue we have developed an in-progress multi-cohort-multi-occasion (MCMO) design in which multiple dimensions of self-concept are assessed and achievement data are collected on multiple occasions over a four-year period from the same children in multiple age cohorts. Students aged 5 and 6 were administered the SDQ (Infants) and Wide Range Achievement Test 3 in November 1998 (N=691, Time 1) and in July, 1999 (N=993, Time 2) along with a new cohort of students aged 5. We present the preliminary findings from the first two waves of data to examine: a) the structure and development of a multidimensional, self-concept; b) the stability of self-concept responses over time, and c) the relationship between prior academic self-concept and subsequent growth in academic achievement; and d) theoretical predictions about the development of self-concept that heretofore has been based primarily on research with older children.

The present investigation extends recent advances in the ability to measure young children's self-concepts developed in our earlier research (Marsh, Craven & Debus, 1991; also see Marsh & Craven, 1997) where we showed that children can reliably differentiate between multiple dimensions of self-concept at an earlier age than previously assumed and that has been recognized elsewhere (e.g., Byrne, 1996; Crain, 1996) as a potentially important breakthrough for research with this age group. For this in-progress study we report preliminary findings based on 2 waves of self-concept and academic achievement data collected from children 5-8 years of age and evaluate the structure, stability and development of young children's self-concepts longitudinally.

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The Importance of Self-concept and Contributions of Australian Research

In Australia and throughout the world, there is a growing tendency among classroom teachers, school counseling staff, school administrators, other early childhood professionals, and parents to assume that schools are responsible for students' personal and social development. For this reason, there is considerable interest in assessing and maximizing students' self-concepts, based in part on the typically implicit assumption that improved self-concept will lead to improved academic achievement and other desirable academic outcomes. A positive self-concept is also valued as a desirable outcome in its own right in many disciplines such as education, early childhood, social, counseling, developmental, and sports psychology. Brookover and Lezotte (1979), in their model of effective schools, suggested that maximizing academic self-concept, self-reliance, and academic achievement should be major outcome goals of schooling. 'The Common and Agreed National Goals of Schooling,' the initial agreement between the Australian Commonwealth and State governments, emphasized the need "to enable all students to achieve high standards of learning and to develop self-confidence, optimism, high self-esteem, respect for others, and achievement of personal excellence" (Australian Education Council, 1989). This goal has since been included in the recent Revised Common and Agreed Goals of Schooling (Ministerial Council on Education, Employment, Training and Youth Affairs, 1999) and reflected in State/Territory syllabus documents (e.g. Board of Studies New South Wales, 1998). In fact, most educational policy statements list the development of a positive self-concept as one of the central goals of education. Despite the importance of self-concept being acknowledged at all levels of education, there is a particular emphasis on developing young children's self-concepts. For example, large-scale intervention programs such as the Head Start program in the United States aimed particularly at very young children who are disadvantaged emphasize the importance of developing a positive self-concept. Thus, Fantuzzo, et al. (1996) argued that our ability to identify early intervention methods that will enhance the social competence of low-income children is contingent upon the availability of developmentally appropriate methods that evidence valid and stable psychological constructs of culturally diverse populations of Head Start children.

For older children, there have been considerable advances in the quality of self-concept research due to stronger theoretical models (e.g. Marsh, Byrne & Shavelson, 1988; Shavelson, Hubner & Stanton, 1976), the development of multidimensional measurement instruments based on theoretical models, and stronger interventions (see Byrne, 1984; 1996; Craven, Marsh & Debus, 1991; Marsh, 1993; Marsh & Craven, 1997; Marsh & Hattie, 1996). Australian research is widely recognised throughout the world for its substantial contributions to these important advances in self-concept research. For example, critical tests of the Shavelson model and its subsequent refinement are based substantially on Australian research (e.g. Marsh, 1993; Marsh & Shavelson, 1985; Marsh, Byrne & Shavelson, 1988). Also the Australian Self Description Questionnaire (SDQ) instruments are internationally regarded as the strongest multidimensional instrument for school-aged students (Boyle, 1994; Byrne, 1984; Hattie, 1992; Wylie; 1989) and have been translated into six different languages (Chinese, French, Spanish, Portuguese, German, Norwegian).

Advances in theory, measurement, research and practice for older students have not been adequately implemented in research with very young children. In particular, psychometrically strong instruments have not been developed for young children and the factorial structure (or dimensionality) of self-concept is not well understood for this age group. This inability to assess self-concept for very young

children impedes teachers' ability to understand the self-concepts of their students that are associated with many desirable outcomes (e.g., academic choice, persistence, achievement) and undermines the quality of feedback that teachers provide to parents when asked to report on self-concept. Researchers (Byrne, 1996; Fantuzzo, et al., 1996; Harter, 1983, Harter & Pike, 1984; Marsh and Craven, 1997; Marsh et al., 1991, Stipek & MacIver, 1989; Wylie, 1989) have suggested that this problem emanates from problems with existing measurement instruments and recommended research on potentially more appropriate assessment procedures (e.g., simplified item contents or pictorial representations, simplified response formats, and individually based interviews instead of conventional paper-and-pencil tests that are group administered). Perhaps, as appears to have been the case for research with older children, progress in theory, research, and practice for young children will be stimulated by the development of better multidimensional measurement instruments.

As background for the present in progress study, three areas of research are briefly summarized. First, we review self-concept measures developed for very young children and summarize the Marsh, Craven, & Debus (1991) study which provides the foundation for this research. Second, we discuss substantive developmental concerns including age and gender differences in self-concept responses by young children and how these relate to patterns found with older children. Finally, we discuss research on the causal ordering of the development of academic self-concept in specific school subjects and how this influences subsequent academic achievement.

Reviews of Existing Measurement Instruments for Young Children

In the last decade there were two major reviews of self-concept measures (Wylie, 1989; Byrne, 1996) for different age groups. Both reviewers noted a large number of different instruments available for very young children, but concluded that no existing measures were adequate and that only two were sufficiently developed to warrant consideration. For both instruments there was a paucity of psychometric evidence (reliability, stability, factor structure) and the evidence that was available was not particularly encouraging. Byrne, although less negative in her subsequent review of these instruments than Wylie (1989), noted largely the same concerns. Essentially no further development of either instrument was reported by Byrne beyond that described seven years earlier by Wylie and there was almost no information to evaluate the construct validity of either instrument (also see Fantuzzo et al., 1996).

A New Adaptive Interview Procedure (Marsh, Craven & Debus, 1991)

Marsh, et al. (1991) described a new, adaptive procedure for assessing multiple dimensions of self-concept for children aged 5-8 using the SDQI. Because this procedure is so central to the present investigation, we will describe this research in some detail. In considering this issue, we explored pictorial self-concept instruments (e.g., Harter & Pike, 1984), but found that the juxtaposition of the pictures and verbal explanations seemed more confusing to young students than the verbal presentations alone. In an individual interview format, the 64 positively worded items from the SDQI were administered to 501 kindergarten, 1st and 2nd grade students. The critical component was the individualized interview format used to collect SDQI responses. Procedures for the administration of the standard SDQI (see Marsh, 1988) were adjusted to enable the modified SDQI to be administered as an individual interview and are described in greater detail by Marsh, et al. (1991). The interviewers were conducted by a large team of teacher education students who had some experience working with young children. All interviewers were given a two-hour training program and subsequently tested children from each of the three age

groups. At each participating school a group of interviewers simultaneously conducted interviews with all students from a particular class. The testing was conducted using an individual, one-on-one interview style format. Each testing session began with a brief set of instructions assuring participants of the confidentiality of their responses and presenting four example items. After reading each example item the interviewer asked the child if he/she understood the sentence. If the child did not understand the sentence the interviewer explained the sentence further, paraphrasing any words the child did not understand, ascertained if the child understood the sentence, re-read the sentence, and requested a response. In a strategy adapted in part from Harter and Pike (1984), the interviewer initially asked the child to respond 'yes' or 'no' to the sentence to indicate whether the sentence was true or false as a description of the child. If the child initially responded 'yes' the interviewer then asked the child if he/she meant 'yes always' or 'yes sometimes'. If the child initially responded 'no' the interviewer then asked the child if he/she meant 'no always' or 'no sometimes'. The second response probe was stated for every response even when it was answered in the initial response (e.g. the child said 'yes always' instead of 'yes'), thus providing a check on the accuracy of the child's initial response. After the child successfully responded to example items and any questions were answered, the interviewers then read aloud each of the 64 positively worded SDQI items. The child was encouraged to seek clarification of any item they did not understand. If the child stated that the item was not understood the interviewer explained the meaning of the item further and ascertained if the child understood the sentence before readministering the item. If the child indicated he/she understood the sentence but could not decide whether to respond yes or no, the interviewer recorded a response of 3, halfway between the responses of 'no sometimes' and 'yes sometimes'. Because this occurred infrequently and children were not told of this option, this middle category was seldom used. Halfway through the administration of the SDQI items the interviewer asked the child to do some physical activities for a brief period before proceeding to administer the remaining 32 items. This procedure was included to cater for young children's short attention spans.

There was an initial concern that the 64-item SDQI instrument would be too long for these very young children. Interestingly, items near the end were more effective than earlier items (in contrast to anticipated fatigue effects). Apparently children learned to respond appropriately so that responses at the end of the instrument had much stronger psychometric properties than items at the beginning of the instrument. This observation has important implications for the typically short instruments used with young children. Based on confirmatory factor analyses (CFAs), Marsh et al. (1991) found support for all the 8 SDQI scales, including the general self-concept scale, at each year level. However, with increasing age the differentiation among the 8 factors improved as inferred from the decreasing size of factor correlations. As part of this research we compared their new assessment procedure with the standard group administration procedure in which the same SDQI items were read aloud to students. Kindergarten children were not able to complete this task, whereas the psychometric properties of group administration responses were substantially poorer than those based on the individual interview responses for students in Years 1 and 2. As part of this research, we also reviewed studies of the development of gender differences in self-concept. However, we reported gender differences for this very young group of children were largely consistent with extrapolations from earlier research with older children.

Although Byrne (1996) did not consider the Marsh et al. (1991) study in her chapter on measures for very young children, she did review the SDQI very positively

in another chapter devoted to measures for somewhat older, pre-adolescent children. As part of this review, Byrne specifically noted the effectiveness of the Marsh et al. (1991) study in adapting the SDQI for use with very young children. She emphasized that the psychometric properties based on this single study were stronger than those provided by any other instruments specifically designed for very young children, clearly demonstrating the need for further research on this promising adaptation of a well-established instrument.

Age and Gender Differences in Responses By Very Young Children

Previous research (see reviews by Marsh & Craven, 1997; Crain, 1996) has identified a reasonably consistent pattern of gender and age differences in global and domain specific areas of self-concept. Although age differences tend to be small, there is a reasonably consistent pattern of self-concepts declining from a young age through to at least adolescence, leveling out, and then increasing through early adulthood. The Marsh et al. (1991) study was important in demonstrating that this trend extended to responses by very young children. More recently, Chapman and Tunmer (1995) also reported that reading self-concept declined with age based on a cross-sectional study of very young children. Although gender differences are small and inconsistent for total self-concept scores, apparently reflecting the diversity of specific domains that may be represented in such a total score, males seem to score more favourably on global esteem scores. However, consistent with Wylie's (1979) suggestion, these small overall effects reflect counter-balancing differences in specific domains, some favoring boys and some favoring girls, that reflect prevailing gender stereotypes. Contrary to expectations, a few recent studies (Marsh, et al., 1991; Eccles, et al. 1993) have shown stereotypic gender differences in responses by very young children that are similar to those typically reported for older children and even adults (e.g., higher Math and Physical self-concepts for boys, higher Verbal self-concepts for girls). However, critical limitations in these studies have been the paucity of studies involving very young children, based in part on complications involved in measuring self-concept at such a young age, and an over-reliance on cross-sectional studies used to infer developmental changes from different groups instead of longitudinal studies of changes for the same children over time.

Most research on age differences in self-concept has focused on mean differences. However, Shavelson, et al. (1976) proposed that self-concept becomes more differentiated with age, but did not offer a clear rationale for evaluating this hypothesis. Marsh (1985; 1990; Marsh, Barnes, Carins & Tidman, 1984), expanding on the Shavelson et al. hypothesis, proposed that self-concepts of very young children are consistently high but that with increasing life experience children learn their relative strengths and weaknesses so that with increasing levels of age: mean levels of self-concept decline, individual self-concepts becomes more differentiated, and self-concept becomes more highly correlated with external indicators of competence (e.g., skills, accomplishments, and self-concepts inferred by significant others). One possible test is that correlations among multiple facets of self-concept become smaller with age -- the multiple facets become more distinct and better differentiated. Marsh (1989) tested this hypothesis with scales from the three SDQ instruments, and Marsh, et al. (1991) extended this approach to responses by very young children. There was support for the hypothesis in that the size of correlations among SDQ scales decreased in size from Kindergarten through to at least Year 5, although no further declines were found for older children. However, here, as in most studies of self-concept development, researchers have relied on cross-sectional comparisons based on

different age cohorts and have not pursued stronger tests of differences over time for the same group of children.

Crain (1996) recently reviewed the development of age and gender differences in self-concept, but noted that the typical poor quality of measurement instruments used in studies of very young children cast doubt on extrapolations from this research. Crain specifically noted the important contributions of the Marsh et al. (1991) study, emphasizing that "several interesting and important findings emerged from this study, paramount of which was that all eight factors from the SDQ-I were present among this young sample, even kindergarteners" (p. 402). Noting that the Marsh, et al. study cast doubt on previous research for this age group, she concluded that "certainly, further examination of very young children's multidimensional self-concept is a fruitful topic for further research" (p. 403). In particular, she highlighted the need for longitudinal research to evaluate substantively meaningful age-related differences in how children view themselves. She argued that since recent studies of young children's self-concepts rely on cross-sectional data it is important that future research is based on longitudinal data to elucidate actual rather than inferred developmental changes in the structure and development of multidimensional facets of young children's self-concept. Such research should help to identify the structure, development and stability of young children's self-concepts over time. Given that Marsh, et al.'s recent research suggests that young children's self-concepts are multidimensional and their new measurement procedure with demonstrated reliability has been trialled and developed, the time is ripe for researchers to elucidate the structure, development and stability of young children's self-concepts over time.

Relations Between Academic Self-concept and Academic Achievement

Parents, teachers, and even researchers typically assume that self-concept and academic achievement are substantially related and, perhaps, that a positive self-concept fosters academic striving behaviors (e.g. academic choice) that can maximize and even change academic achievement (Marsh & Craven, 1997). However, early research based on undifferentiated measures of self-concept provides weak support for this contention. More recently, researchers have shown that academic achievement is substantially correlated with academic components of self-concept, but relatively uncorrelated (or even negatively correlated with) nonacademic components of self-concept, and that academic achievement in particular domains are more highly correlated with academic self-concepts in the matching domain (e.g., mathematics achievement and Math self-concept) than self-concepts in nonmatching domains (see Byrne, 1996; Marsh, 1993; Marsh & Craven, 1997). Although academic self-concept should be substantially correlated with both classroom based achievement measures (e.g., school grades and other teacher assessments) and standardized test scores, relations with classroom based measures tend to be stronger because they are a more salient source of feedback to students that also reflect motivational properties that are likely to be related to self-concept (Marsh, 1987; 1990; 1993; Wylie, 1979).

Whereas research showing the extreme differentiation among different areas of self-concept for older children clearly supports the Shavelson et al. model and the multidimensionality of self-concept, it also posed some complications. The strong hierarchical structure posited by Shavelson et al. required self-concepts to be substantially correlated, but the small sizes of correlations actually observed implied that any hierarchical structure of the self-concept responses must be much weaker than anticipated. More specifically, in the Shavelson et al. model Math and Verbal self-concepts were assumed to be correlated substantially so that they could be described in terms of a single higher-order academic self-concept. Factor analyses,

however, resulted in correlations between Verbal and Math self-concepts that were close to zero. Complications such as these led to the Marsh/Shavelson revision of the original Shavelson et al. model and the development of the internal/external frame of reference model (Marsh, Byrne & Shavelson, 1988; Marsh & Shavelson, 1985; Marsh, 1990b; 1993a). At all age levels considered, differentiation among different areas of academic self-concept was stronger than differentiation among different areas of academic achievement. However, Marsh (1986) specifically noted that the near-zero correlation between Math and Verbal self-concept and the extreme domain specificity of relations with achievement in different school subjects was particularly evident for children in at least Year 4, but was not so evident for very young children. This finding probably reflects the inappropriateness of the traditional group administration for very young children used in this study and the emerging differentiation among different components of academic self-concept and their relations to academic achievement in different school subjects. A potentially important contribution of the present investigation is to test these speculations with measures of self-concept that are more appropriate for very young children and to simultaneously evaluate support in cross-sectional comparisons of different age cohorts and longitudinal comparisons of the same children over 2 time periods.

Aims

Marsh et al. (1991) provided a promising advance in the measurement of very young children's self-concepts and in clarifying the emergence and progressive differentiation of specific facets of self-concept for this age group. Due in part to limitations in self-concept research with very young children, reviewers (e.g., Byrne, 1996; Crain, 1996) noted the important contributions of this study, but also emphasized the need to followup this research with longitudinal studies more appropriate for evaluating the development of self-concept. In response to such concerns, the present investigation is based on the Marsh et al. (1991) study, but expands on the empirical and theoretical implications of that earlier research in a number of ways. In particular, the earlier study was based on a single wave of data from three age cohorts so that substantive and developmental implications relied primarily on cross-sectional comparisons. Here, we report preliminary findings from 2 waves of data collected from the same children, we contrast cross-sectional (multiple age cohort) comparisons with true longitudinal (multiple occasion) comparisons. This provides a much stronger basis for evaluating age-related differences in reliability and dimensionality, gender differences and stability over time. Finally, the inclusion of academic achievement measures opens up an entirely new, largely unexplored area of research into the causal ordering of academic self-concept and achievement with very young children that is possible because of the availability of stronger measures of self-concept that are appropriate for very young children. More specifically, in addition to building on the earlier research by providing further psychometric support for the use of the individually administered SDQI with young children, the present investigation is designed to:

- test the Shavelson et al. (1976) hypothesis that self-concept becomes more differentiated with age and to provide more specific data on how the factor structure of self-concept varies over time for children aged 5-8;
- evaluate the stability of young children's self-concepts over time;
- evaluate gender and age differences for young children longitudinally as well as cross-sectionally; and

- evaluate the emerging pattern of relations among different components of academic self-concept, of relations between academic self-concept and achievement in specific school subjects, and the causal ordering of academic self-concept and achievement.

From a practical perspective the ability to measure the self-concepts of young children and elucidate developments in self-concept over time enables early childhood practitioners to: understand young children better, identify an accurate basis for assessment, and provide an outcome measure for a variety of interventions.

Methodology

Students in K and 1 were administered instrumentation in November 1998 and in July, 1999 along with a new cohort of K students. The sample consists of students receiving parental permission to participate in the study who attend one of four schools in the Western Sydney Metropolitan region.

Materials and Methods

The multiple dimensions of self-concept will be based on responses to the SDQI using the individual interview technique developed by Marsh, et al. (1991) and discussed earlier. These instruments are administered by undergraduate teacher-education students with some experience in school settings who have been given the special two-hour training program described by Marsh, et al. (1991).

Standardized reading, spelling and mathematics achievement was assessed using the Wide Range Achievement Test (WRAT3). This test, is specially designed to be appropriate for ages 5 - 18.

Analyses

The statistical analyses will consist of an evaluation of the psychometric properties (internal consistency reliability, stability over time, factor structure, structural equation models) of the self-concept responses, of sex and age differences in the self-concept ratings, and of the causal ordering of academic self-concept and academic achievement. CFAs and SEMs will be conducted with LISREL8 (Joreskog & Sorbom, 1993) using maximum likelihood estimates derived from covariance matrices.

Critical issues in the preliminary analyses are to evaluate emerging developmental patterns among the variables. This design allows us to evaluate cross-sectional comparisons of different age cohorts, true longitudinal comparisons of responses for the same cohort over two occasions, and the interaction of multi-cohort x multi-occasion comparisons that provide a test of the generality of longitudinal comparisons over different cohorts (Baltes, & Nesselroade, 1979). Patterns of particular interest are: The structure of self-concept, age differences in each of the constructs, and the relations between the constructs.

Results: Preliminary Analyses

Internal Consistency

Estimates of reliability for each of the 8 SDQ (Infants) scales at T1 and T2 for the total sample ranged from .66 to .82 (see Table 1). Means for each of these scale scores ranged from 4.20 to 4.46 and standard deviations were typically small (see Table 1). As expected, preliminary analyses suggest that coefficient alpha estimates of reliability increase with age with the exception of the general self-concept scale, based on both cross-sectional and longitudinal comparisons. In contrast to the scale scores, the total (total academic, total nonacademic, and total self) scores were more reliable

(alpha reliability's from .87 to .94) and these as did not vary systematically as a function of cross-sectional or longitudinal age comparisons. The total scores were more reliable than the individual scores because they were based on so many more responses. However, the lack of consistent age differences for total scores was in marked contrast to the individual scores (except for the general self-concept scale which may be more like the total scores in that its intent was to infer a overall evaluation of self). This pattern of results, increasing internal consistency estimates of reliability with age for specific self-concept scales but not for general self-concept and total scores, implies that older children may be more clearly differentiating among the specific components of self-concept.

Insert Table 1 About Here

Factor Structure

CFA provides a particularly powerful tool for evaluating the factor structure underlying responses by these young children. Results from CFAs conducted for total responses at T1 and T2 are summarized in Table 2. Firstly we tested a 16 factor model that incorporated the 8 scale scores from T1, and 8 scale scores from T2 (labelled "8+8 Factors" in Table 2). Given previous research (Marsh, Craven, & Debus, in press) has shown that it is useful to examine cognitive and affective components of self-concept separately, we also tested a 22 factor model that split the T1 and T2 scales of mathematics, reading and school self-concept into their separate cognitive and affective components, resulting in 11 scales at T1 and T2 (labelled "11+11 Factors" in Table 2).

Two variations of these 2 models of factor structure were considered. In the first variation, there were no correlated uniquenesses (labeled "no CUs" in Table 2)--the residual variance associated with each measured variable was assumed to be uncorrelated with residual variances associated with other measured variables. In the second variation, the residual variance associated for each T1 measured variable was allowed to be correlated with its matching T2 residual variance term (labeled "CUs" in Table 2). Because these models were nested, the difference in chi-square values can be evaluated in relation to the difference in df. Although the RNI for the less restrictive of nested models should typically be larger, the difference in RNIs provided an indicator of the substantive importance of including correlated uniquenesses. It was substantively important to evaluate correlated uniquenesses because if the correlated uniquenesses were substantial and positive, the failure to incorporate them into CFA models would result in positively biased estimates of stability coefficients.

Examination of Table 2 shows that the fit based on the total group is clearly better for the 22 factor model (11T1+11T2 factors) than for the 16 factor model (8T1+8T2 factors), and somewhat better when correlated uniquenesses are included. Therefore the separation of the cognitive and affective components of reading, maths and schools self-concept, improves the model fit. Hence, all subsequent preliminary analyses were based on this model. The fit of this model is good according to the RMSEA and reasonable according to the RNI (although the TLI is slightly below the recommended .90).

Insert Table 2 About Here

Stability Over Time: Within-Group Tests of Invariance

The best fitting model for the total sample posits 22 latent factors (11T1+11T2) and correlated uniquenesses relating responses to the same measured variable on different occasions. This model is the basis of all the remaining models considered here that impose various equality constraints on matching parameter estimates for the same group over time (within-group invariance).

Firstly we tested a model where there was no invariance within the groups over T1 and T2 (labeled in Table 3 as "NO INV"). In the second model in Table 2 we constrained factor loadings to be invariant at T1 and T2. The minimal condition of factorial invariance is typically the invariance of factor loadings. The results for the second model provide support for the invariance of factor loadings over time (RNI=.9002 and RMSEA=.0399), although the TLI of .88 is below the recommended value of .9. In subsequent models we imposed increasing constraints of equality of parameters such that: the third model presented in Table 3 constrained factor loadings (FL) and factor variances (FV) to be equal at T1 and T2, the fourth model constrained FL, FV, and factor correlations (FC) to be equal at T1 and T2, and the final model constrained FL, FV, FC and uniquenesses to be equal at T1 and T2.

Comparison of the goodness of fit indices (Table 3) of the 5 models examined suggests that there is good support for the invariance over time of factor loadings, factor variances, and factor correlations (Model 4). Support for invariance of uniquenesses (Model 5) is not quite so good as decreases in the RNI and TLI are associated with increases in RMSEA. These results suggest that self-concept responses at T2 tend to be somewhat more reliable, but even these differences are not large.

Insert Table 3 About Here

Examination of the factor correlations (Table 4) for T1 and T2 self-concept scores shows that there are modest correlations between these scores, but consistently higher correlations between T1 and T2 nonacademic facets of self-concept. For example, factor correlations for nonacademic facets of self-concept range from .35 to .67, whereas factor correlations for academic facets of self-concept range from .30 to .44 (see Table 4). These results suggest that nonacademic facets of self-concept may be more stable over time than academic facets of self-concept for young children.

Insert Table 4 About Here

Between-Group Tests of Invariance Over Age Cohorts

In SEM studies with multiple groups it is possible to test the invariance (equality) of any one, any set, or all parameter estimates across the multiple groups. Here we evaluated the invariance of various sets of parameters across the multiple age groups of Kindergarten and Year 1 at T1, and 6 months later at time 2 (Table 5). Firstly, we calculated goodness of fit indices for the 2 groups (T1 and T2) separately based on the previously established 22 factor model with correlated uniquenesses (Model 1a and 1b, Table 5). Based on the RNI and TLI, the fit is not fully acceptable (gt .90) for either age group, but the RMSEA is acceptable (lt .05) (Models, 1a and 1b, Table 5). The fit for the older group is marginally better than for the younger group (larger TLIs and RNIs and smaller RMSEAs).

In the least restrictive model (Model 1, Table 5), no parameters were constrained to be equal across the two age cohorts. In Model 2 the factor loadings (FL) were constrained to be invariant across the two age cohorts. In Model 3 FL, and factor variances (FV) were constrained to be invariant across the age cohorts. In Model 4 FL, FV and factor correlations (FC) were constrained to be invariant across the age cohorts. In Model 5 all parameter estimates were constrained to be invariant across the age cohorts.

The tests of invariance are not completely conclusive. There is not clear support for any invariance (as TLI and RMSEA drop for each imposition of new invariance constraints). However, the drops are not particularly large, suggesting reasonable support for invariance of Factor Loadings, Factor Variances, and Factor correlations (but probably not uniquenesses).

Insert Table 5 About Here

Relations Between Academic Achievement and Self-Concept Relations Over Time

Preliminary SEM analyses were undertaken to test the relationship of academic self-concept and academic achievement over time. These analyses were based on an 18 factor model (9 Factors T1 and 9 Factors T2) of the relation between separate affective and cognitive component of maths, reading and school self-concept (6 self-concept factors) and three achievement factors for maths, reading and spelling at T1 and T2. Tests of invariance comprised adding increasing equality constraints similar to the analyses of models described previously (see Table 6).

Examination of the goodness of fit indices in Table 2 demonstrates support for a good fit for the model with no invariance (Model 1, Table 6). However, the drops are not particularly large when equality constraints are added for Factor Loadings, Factor Variances, and Factor Correlations, suggesting reasonable support for invariance for Model 5. Since the TLI drops below .9 and the RMSEA increases when invariance is applied for uniquenesses, Model 5 does not seem to be supported. Hence there is reasonable support for invariance over time with the exception of uniquenesses.

Examination of the factor correlation matrix (Table 6) shows that there are modest correlations between achievement scores and cognitive self-concept factors, but consistently smaller correlations between achievement scores and associated affective self-concept factors. For example, at T1 maths achievement correlated .21 with cognitive maths self-concept and .09 with maths affective self-concept. The math and verbal (spelling and reading) achievement scores are also consistently more highly correlated with math and verbal self-concepts than school self-concept. This is important because it provides new support for the separation of cognitive and affective components of self-concept (even though these components are highly correlated).

Correlations of cognitive maths self-concept and maths achievement are modest (about .2) and provide support for discriminant validity in that maths achievement is more highly correlated with math self-concept than reading or school self-concepts. Correlations of cognitive reading self-concept and verbal achievement are also modest at T1 (about .16 & .15), but better at T2 (.35 & .33) and provide support for discriminant validity in that verbal achievement is more highly correlated with reading self-concept than math or school self-concepts at T2.

Insert Table 6 About Here

Summary

Preliminary results of the present in-progress investigation provide stronger support for the construct validity of self-concept responses based on the SDQ (Infants) than those based on other instruments designed for very young children reviewed by Byrne (1996) or Wylie (1989). The individual interview-style administration was an important feature of the strategy used here that Marsh et al. (1991) showed to be more effective than group administration procedures -- even when the items were read aloud to students. A significant difference between this study and most other research with very young children was the length of the questionnaire -- 64 items. The preliminary results of this investigation have important implications for early childhood researchers in that the use of short instruments may be counter-productive and may account for some of the difficulties researchers have in obtaining responses from very young children that yield good psychometric properties. The separation of competency and affective components of self-concept was supported for young children. In addition, new support was found for the separation of these self-concept components based on the relationship of academic achievement scores to cognitive and affective self-concept domains, whereby it was demonstrated that achievement was more strongly correlated with cognitive components of self-concept than affective components. These results are important, as they offer support for the separation of cognitive and affective components of self-concept based on an evaluation of "between-construct" aspects of the separation in which the competency and affect components are shown to have distinctive patterns of results with an external validity criteria. Hence, it is useful for researchers to consider the separation of these self-concept components for studies with young children. Preliminary analyses also suggest that factor loadings, factor variances and factor correlations are invariant over time and over age. Hence, over a period of 6 months, the structure of young children's self-concepts and the relationship of self-concept to academic achievement, was demonstrated to be relatively stable over time and over the two age cohorts considered thus far. Hence, the preliminary results suggest the study will potentially enrich our understanding of the structure, development and relation of young children's self-concepts in a critical developmental period.

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Table 1:

Summary Statistics for the Self-Description Questionnaire Scales at Time 1 (N=691) and Time 2 (N=993)

Self-Concept Scale	Standardised Alpha	M	SD
T1 Physical	.66	4.36	.54
T2 Physical	.68	4.41	.53
T1 Appearance	.82	4.20	.70
T2 Appearance	.83	4.25	.70
T1 Peer	.76	4.25	.67
T2 Peer	.78	4.29	.65
T1 Parent	.68	4.46	.51
T2 Parent	.71	4.49	.52
T1 Maths	.82	4.30	.70
T2 Maths	.82	4.37	.67
T1 Reading	.82	4.34	.70
T2 Reading	.79	4.46	.59
T1 School	.79	4.30	.66
T2 School	.77	4.39	.58
T1 General	.72	4.32	.57
T2 General	.72	4.40	.53
T1 Academic	.91	4.31	.59
T2 Academic	.90	**4.41**	.53
T1 Nonacademic	.87	4.32	.46
T2 Nonacademic	.88	4.36	.46
T1 Total	.94	4.32	.49
T2 Total	.94	4.39	.45

Table 2:

Goodness of Fit Indices for Alternative Factor Structure Models

CHISQ	DF	RNI	TLI	RMSEA	DESCRIPTION
4157.65	1832	.8560	.8416	.0461	8+8 FACTORS NO CUs
3931.07	1800	.8681	.8523	.0445	8+8 FACTORS 32CUs
3479.18	1721	.8911	.8725	.0414	11+11 FACTORS NO CUs
3278.02	1687	.9015	.8823	.0397	11+11 FACTORS 32CUs

Note. CU- Correlated Uniquenesses.

Table 3:

Goodness of Fit Indices for Within Group Tests of Invariance Over Time

MODEL	CHISQ	DF	RNI	TLI	RMSEA	DESCRIPT
1	3278.03	1689	.9016	.8826	.0397	2GRP NO INV 11+11 FACTORS 32CU
2	3311.37	1699	.9002	.8816	.0399	2GRP WGINV=FL 11+11 FACTORS 32CU
3	3330.45	1721	.9003	.8833	.0396	2GRP WGINV=FL,FV 11+11 FACTORS 32CU
4	3446.70	1776	.8966	.8826	.0397	2GRP WGINV=FL,FV,FC 11+11 FACTORS 32CU
5	3595.95	1808	.8893	.8766	.0407	2GRP WGINV=FL,FV,FC,U-CU 11+11 FACT 32CU

Note. WGINV - within group invariance, FL - Factor Loadings invariant, FV - Factor Variances invariant, FC - Factor Correlations invariant, U-CU - Uniquenesses invariant.

Table 4

Factor Correlations for T1 and T2 Self-Concept Scores

Self-Concept Facet	Factor Correlation (T1 vs. T2)
Physical	.67
Appearance	.50
Peer	.44
Parent	.35
General	.38
Reading Affective	.30
Reading Cognitive	.38
Maths Affective	.38
Maths Cognitive	.36
School Affective	.44
School Cognitive	.37

Table 5:

Between Group Tests of Invariance Over Age

MODEL	CHISQ	DF	RNI	TLI	RMSEA	DESCRIPTION
1a	2976.08	1689	.844	.814	.052	GRP K-1 22F,32CU
1b	2725.58	1689	.883	.860	.045	GRP 1-2 22F,32CU
1	5701.66	3378	.864	.838	.048	2GRP 22F,32CU
2	5802.33	3420	.861	.836	.048	2GRP BGINV=FL
3	5864.90	3442	.858	.834	.049	2GRP FL&FV
4	6309.47	3673	.846	.831	.049	2GRP BGINV=FL,FV,FC
5	6622.83	3769	.833	.821	.050	2GRP BGINV=FL,FV,FC,U-CU
Null Models						
	10251.76	2015	.000	.000	.120	GRP K-1 NULL MODEL
	10862.78	2015	.000	.000	.119	GRP 1-2 NULL MODEL
	21114.54	4030	.000	.000	.119	2GRP NULL MODEL

Note. BGINV - between group invariance, GRP - Group, FL - Factor Loadings invariant, FV - Factor Variances invariant, FC - Factor Correlations invariant, U-CU - Uniquenesses invariant.